

Schedule of the lectures on biophysics – Branch General Medicine 2025-2026)

Place: Institute of Experimental Oncology, U Nemocnice 5, Lecture room 097

Week	Date	Lecture
Week 1	Tue 30.9.2025 12:35-13:50	Prof. Jiráček: Structure of matter I (Atom, Basic particles, Antiparticles, Force interactions, Energy)
	We 01.10.2025 12:30-13:45	Prof. Jiráček: Quantum Physics I (Corpuscular-wave dualism, Behaviour of a particle, TEM, Quantum numbers)
Week 2	Tue 07.10.2025 12:35-13:50	Prof. Jiráček: Quantum Physics II (Spectrum of hydrogen atom, Electron structure of heavy atoms, Emission, Excitation, Ionization, Photoelectric effect, Luminescence, Optical imaging)
	We 08.10.2025 12:30-13:45	Prof. Jiráček: Forces acting among atoms (Forces acting among atoms, Mass spectroscopy, Atomic nucleus, Binding energy, Mass defect, Potential barrier of atomic nucleus)
Week 3	Tue 14.10.2025 12:35-13:50	Prof. Jiráček: Bioelectric phenomena I (Electric phenomena, Electric laws, Ohm's law, Resistance, Impedance, Wheatstone bridge, Permittivity, Effects of el. current, Electrotherapy)
	We 15. 10.2025 12:30-13:45	Prof. Jiráček: Bioelectric phenomena II (Membrane transport, Membrane potential, Nernst potential, Sodium-Potassium pump ATP-ADP cycle, Action potential, All or none law, Rheobase, Chronaxie, Conduction of action potential, Ion channel, Principle of ECG)
Week 4	Tue 21.10.2025 12:35-13:50	MUDr. Kyplová: Bioelectric phenomena III (Electrodiagnostic methods and their clinical applications, Heart, Action potential in heart cell, Laser-Clinical applications)
	We 22.10.2025 12:30-13:45	RNDr. Zápotocký: Thermodynamics I (Laws of thermodynamics, Propagation of heat energy, Bioenergetics, Measurement of temperature, Calorimetry, Thermal losses)
Week 5	We 29.10.2025 12:30-13:45	RNDr. Zápotocký: Thermodynamics II (Thermodynamic systems, Work and heat, State quantities, Internal energy, Enthalpy, Entropy, Free energy, Free enthalpy, Chemical potential)
Week 6	Tue 04.11.2025 12:35-13:50	Prof. Jiráček: Acoustics (Definition, Basic quantities, Doppler's effect, Ultrasound, Piezoelectric effect, Ultrasound imaging)
	We 05.11.2025 12:30-13:45	Assoc. Prof. Stanicová: Bioacoustics (Biophysics of hearing, Weber-Fechner's law, Field of hearing, Complex tones, Principal of hearing)
Week 7	Tue 11.11.2025 12:35-13:50	Prof. Jiráček: Molecular biophysics I (Forces acting among molecules, States of matter, Gaseous phase, Kinetic theory of gases, Dalton law, Henry law, Graham law, Equipartition theorem, Real gas)
	We 12.11.2025 12:30-13:45	Prof. Jiráček: Molecular biophysics II (Liquid phase, Water, Solid phase, Change of phases, Gibbs rule of phases, Dispersion systems, Colloidal dispersion, Nephelometry)

Week 8	Tue 18.11.2025 12:35-13:50	MUDr. Štěpánek: Statistical analyses (Error of measurement, Data evaluation)
	We 19.11.2025 12:30-13:45	Assoc. Prof. Stanicová: Optics I (Light, Interaction of light with matter, Ray optics, Lens equation, Optical power, Microscope)
Week 9	Tue 25.11.2025 12:35-13:50	Assoc. Prof. Stanicová: Optics II (Wave optics, Interference of light, Diffraction of light, Dispersion of light, Rayleigh and Raman scattering, Raman spectroscopy, Polarization of light)
	We 26.11.2025 12:30-13:45	Assoc. Prof. Stanicová: Optics III (Biophysics of vision, Eye defects and their correction, Laser)
Week 10	Tue 02.12.2025 12:35-13:50	Prof. Jiráček: Molecular biophysics III (Sedimentation, Dialysis, Electric double-layer of colloidal particles, Electrophoresis, Transport phenomena, Energy of the moving fluid)
	We 03.12.2025 12:30-13:45	Prof. Jiráček: Molecular biophysics IV (Law of Laplace, Surfactant, Viscosity, Hagen-Poiseuille law, Reynolds number, Diffusion)
Week 11	Tue 9.12.2025 12:35-13:50	Prof. Jiráček: Molecular biophysics V (Colligative properties of solutions, Osmotic pressure, Starling hypothesis, Phase border phenomena, Surface tension, Adsorption)
	We 10.12.2025 12:30-13:45	Prof. Jiráček: Magnetic Resonance I (Magnetic properties of nuclei, Principle of MR)
Week 12	Tue 16.12.2025 12:35-13:50	Prof. Jiráček: Magnetic Resonance II (Image formation, MR spectroscopy, Hardware)
	We 17.12.2025 12:30-13:45	Prof. Jiráček: X-ray imaging (X-ray production, principle of X-ray imaging)
Week 13	Tue 06.01.2026 12:35-13:50	Prof. Jiráček: CT imaging (principle of Computed tomography), CT image formation, X-ray side effects, Therapy, Contrast agents
	We 07.01.2026 12:30-13:45	Prof. Jiráček: Radioactivity (Law of radioactive decay, Radioactive equilibrium, Biological and effective half-life, Kinds of radioactive decay), Therapy - Leksell Gamma Knife
Week 14	Tue 13.1.2026 12:35-13:50	Prof. Jiráček: Radioactivity (Gamma camera, SPECT, PET)
	We 14.1.2026 12:30-13:45	Prof. Jiráček: Imaging methods (Contrast agents for ultrasound, computed tomography and magnetic resonance, fMRI, Spectroscopy, Optoacoustic imaging, Diffusion/Perfusion, Thermography, Magnetic Particle imaging)
Week 15		